RV Poseidon Cruise POS507

Central Baltic Sea

Cruise Report

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CONTENTS

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2. Scientific Background and Goals

Based on the data and material collected mainly in and around the Landsort Deep and the Gotland Basin during the proposed cruise we aim to address following specific scientific questions:

a. What is the distribution/stratification of biomarkers in the water column and sediments of the Gotland Basin and Landsort Deep and how does this affect the proxy application in long sediment cores?

Following previous studies based on the analysis of lipids (e.g. Berndmeyer et al., 2014) and prokaryotic organisms (e.g. Labrenz et al., 2007; Berg et al., 2014) in the water columns of the Bornholm Basin, the Landsort Deep and the Gotland Basin, we are aiming to analyze the stratification of biomarkers (including intact and core branched, isoprenoidal and hydroxylated analogues of glycerol dialkyl glycerol tetraethers, alkenones and certain sterols and hydrocarbons). We want to apply in parallel lipid analysis and molecular methods (16S rRNA/rRNA gene, bacterial and archaeal amoA mRNA/amoA gene fingerprints and clone libraries) in order to constrain the depth habitats and interrelations of the organisms producing the biomarkers of interest.

b. What is the importance of trace metal scavenging by redoxcline-derived MnO_x particles and of Mn carbonate formation for sedimentary trace metal signatures of dynamic anoxic basins?

More specifically we intend to investigate the trace element cycling (Dellwig et al., 2010) and Mn carbonate formation during the re-establishment of sulphidic bottom water conditions subsequent to the MBI in 2014/15 in the Gotland Basin (Mohrholz et al., 2015). We also plan to examine the spatial distribution of recent and sub-recent Mn carbonates in the Gotland Basin and will study the potential impact of the MBI in 2014/15 on the water column and sediments of the Landsort Deep. Accordingly, we will also investigate the spatial distribution of sub-recent Mn carbonates with respect to water depth in the Landsort Deep .

c. How did bottom currents affected sedimentation in the Landsort Deep during the Late Holocene and what was the paleoceanographic/paleoclimatologic relevance of these changes?

Contourite deposits often reflect discontinuous sedimentation related to changes in bottom current activity. Latter may respond to changes in the general circulation that is ultimately triggered by complex interactions with the surface climatology of the basin. Accurate mapping and sampling of the contourite sediments, their precise dating, and multi-proxy reconstructions should reveal major changes in the sedimentation regime.

d. Are the transparent seismic units mass wasting deposits? What is the composition and the stratigraphic position of the suspected slide deposits?

Previously described debrites in the Baltic Sea have been related to the drainage of the Baltic Ice Lake (Hühnerbach and Masson 2004, Virtasalo et al. 2007). To answer the question whether debrites in the Landsort Deep are related to abrupt water level changes in the Baltic Sea, the stratigraphy of the Landsort Deep has to be developed and especially material directly above the suspected debrites has to be dated. Linking the debrite flows to a stratigraphic position will also allow to determine the frequency of these types of failure.

e. Can the source area of the suspected debrites be recognized, what are the dimensions of the debritic material and what was the geological process of failure?

The suspected debrite material is located in the southern part of Landsort Deep, where data coverage is limited and focused on the narrow thalweg. Therefore, both source area and volume of the failed material are unknown. Geotechnical sampling and tests of unfailed sediment may allow to understand the failure conditions.

3. Cruise Narrative

On the 15th October noon, RV POSEIDON departed from Warnemünde for a 2 days long transit across the Baltic Sea to arrive the main working area in the central Baltic Sea on Monday morning the 17th Oktober. With 10 IOW scientists on board the transit time was used to prepare the labs and equipment for the planned work. Main task in the eastern Gotland Basin was to collect surface sediments by means of a multicorer from two depth transects in the eastern part of the basin. During the first two days we concentrated on the southern transect consisting of eight multicorer stations and one multibeam/SES sediment acoustic profile. The third day we partly spent on the long-term monitoring station TF271 in the central part of the eastern Gotland Basin collecting CTD-rosette water samples for trace element studies and large volume water samples of 800 liters each from 4 water depths for filtration and organic biomarker studies. Later that day we completed our second northern multicorer transect and used the nighttime and about 15 hours to change over to our second main working area northwest of Gotland Island, the Landsort Deep.

Generally, our 10 days working program in the Landsort Deep area consisted of nighttime multibeam and sediment acoustic profiling and daytime sediment coring by means of multicorer and gravity corer. During the first two days, we successfully recovered three long sediment cores and multicores at six stations before we had to interrupt our coring program for two days due to bad weather conditions. However, we used this time for an extensive mapping program in the southern and northeastern part of the basin, which will form a valuable source of information regarding the sedimentation pathways to the basin and the morphological constraints for the bottom currents entering the basin from the north. On 24 October, we resumed our coring work at three stations on a profile crossing a drift sediment body in the deep northern part of the basin. The next day, on Tuesday we used for water column work comparable to the main station in the first working area, with several CTD-rosette and Giant Water Sampler casts down to 430 m water depth. Wednesday and Thursday, we again worked on geological sampling stations in the central part of the basin interrupted by a nighttime sparker seismic reconnaissance. Unfortunately, this profiling ended earlier than expected due to an, on-board irreparable, failure of our equipment. Continuing with multicorer sampling, our station work was interrupted again on 28 October due to bad weather conditions, but was resumed later that day for further gravity coring. Saturday 29 October we used for two last coring stations in the southern part of the basin to return in the later afternoon to the central deep station completing the water column work with further CTD-rosette casts. After a last night of profiling and a multicorer station in the southern part of our working area, bad weather prohibited further planned work and we headed southward to reach the western Bornholm Basin for a biological sampling station on the 31 November. After a last short biological sampling station in the Arkona Basin, RV Poseidon arrived on the 1 November morning in Warnemünde, were the cruise ended.

4. Operations and Preliminary Results

4.1. CTD-Profiling and Rosette

During the cruise a CTD system composed of SBE9plus and a 13 Hydrobios free flow bottles of 5L each was used. The CTD had additionally a second temperature and conductivity sensor and sensors for dissolved oxygen, turbidity and chlorophyll a as well mounted and an altimeter devise to detect the bottom. All cast were carried out over the full water depth (see list of stations in the appendix for additional details).

A total number of 13 CTD casts for inorganic-geochemical objectives were obtained in the Gotland Basin (5 casts) and the Landsort Deep (8 casts). From selected depth covering the entire water column, about 100 samples were taken for the determination of dissolved and particulate trace metals, H_2S, and nutrients. While metal analyses will be carried out at the IOW by ICP-OES and ICP-MS, H_2S and nutrients will be measured spectrophotometrically. In the Gotland Basin, a special emphasis was put on manganese cycling and the coupled behaviour of redox-sensitive trace metals under the still present influence of the major Baltic inflow (MBI) from 2014/15 (Mohrholz et al., 2015). While anoxic conditions seem to be re-established in the bottom waters of the Gotland Basin until about 220 m water depth, the CTD data shown in Fig. 4-1 still indicate a MBI-related presence of oxygen until about 90 m. In following interval between 90 and 70 m oxygen concentration partly drop again to zero due to remnants of the former pelagic redoxcline. In the anoxic parts of the profile, turbidity clearly increases, which is most likely due enhanced abundance of oxidized sulphur species like e.g. elemental sulphur.

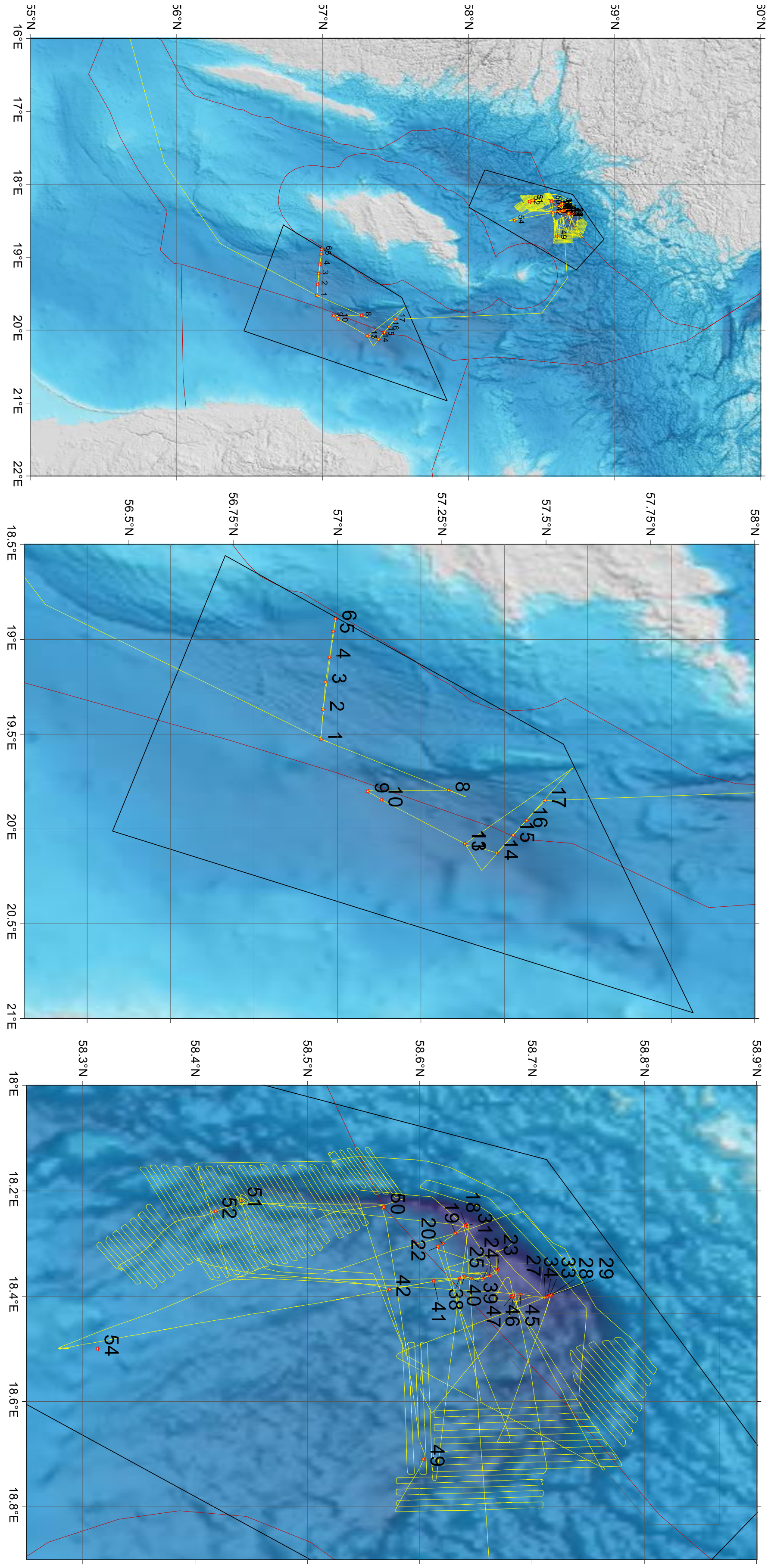

Fig. 3-1: Working areas in the central Baltic Sea, ship track (yellow line), and stations.

For comparison with a typical euxinic situation a similar sampling strategy was performed at two sites in the central and the north-eastern Landsort Deep at about 435 and 215 m water depth, respectively. Because oxygen concentrations remain at zero below ca. 70 m water depth, evidence for a potential impact of the MBI in 2014/2015 could not be derived from our CTD casts so far. However, the analyses of metals and H_2S will possibly help to identify possible oxidation effects by intrusions of low-oxygen waters from the Gotland Basin area.

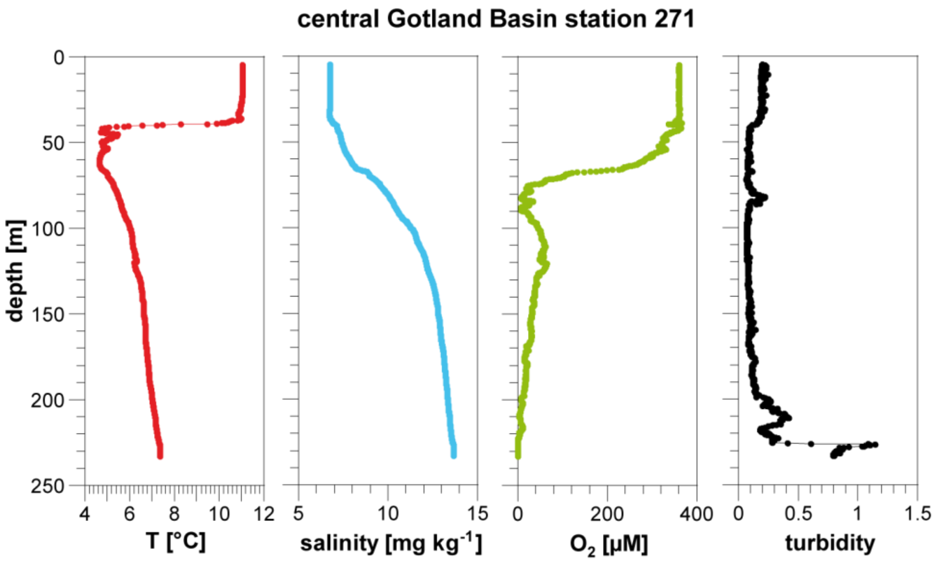

Fig. 4.1-1: CTD cast V0004F01 from the central Gotland Basin at the monitoring station 271 showing water temperature, salinity, oxygen, and tubidity versus water depth.

4.2. Large Volume Water Sampling

In parallel to samples for inorganic geochemistry, large volumes of water (300 to 800 L) were sampled with a giant water sampler (400 L; Fig. 4-2a) at different depths in the Landsort Deep and the Gotland and Bornholm basins (Table 4-1). Depending on the concentrations of dissolved oxygen, the near-surface layer, the lower redoxcline and the near-bottom layer of the water column were sampled. After temporarily storing the sampled water in large tanks (capacity of 1200 L; Fig. 4-2b), the water has been filtered using 0.7 µm GF/F filters with a flow rate of 1.5-2 L min^{-1}. The filters were usually of light to dark brown color except the one from the bottom water of the Gotland basin which was black due to the presence of Mn oxides (Fig. 4-2cd).

The filters will be extracted with different solvents and the lipid composition of the water will be studied including certain hydrocarbons, ketones and more polar lipids such as diols, sterols and alcohols, which represent valuable biomarkers and paleoenvironmental proxies for the Baltic Sea (Kaiser and Arz, 2016). A major issue will be the analysis of hydroxylated and isoprenoid glycerol dialkyl glycerol tetraethers (GDGTs), which are membrane lipids derived mainly from Thaumarchaeota and Euryarchaeota, and branched GDGTs, which are produced very likely by soil acidobacteria (Schouten et al., 2013).

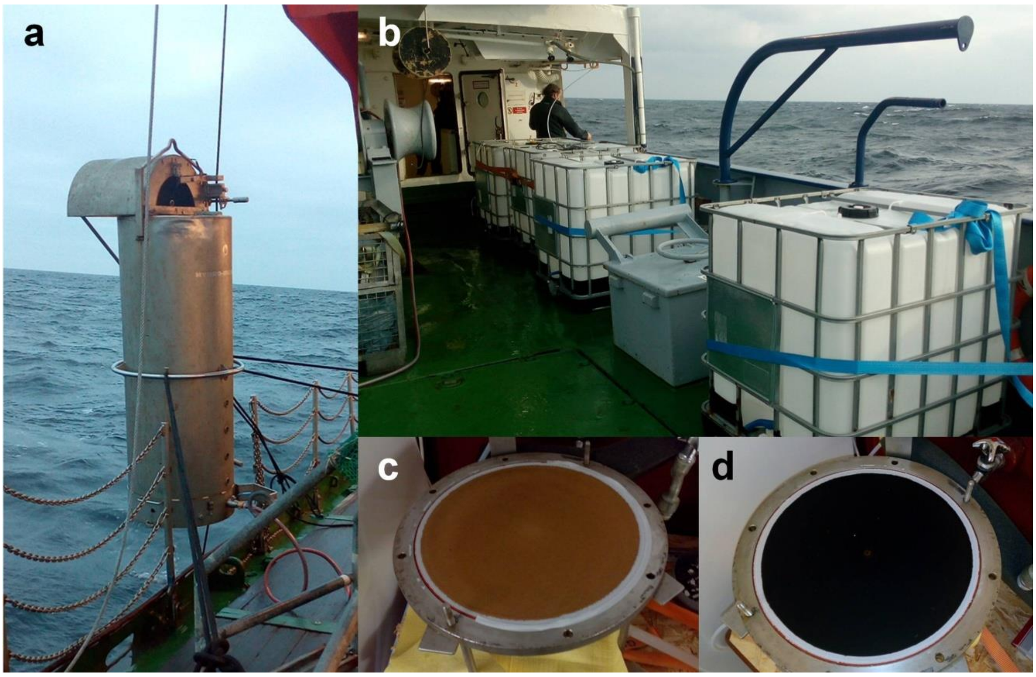

Fig. 4.2-1: Pictures of (a) the giant water sampler, (b) the water tanks and filters from the Gotland basin at 5 (c) and 220 (d) meters water depth.

Both intact polar and core GDGTs will be quantified in order to estimate the amount of, respectively, living and dead cells. Furthermore, in collaboration with Klaus Jürgens (IOW), subsamples were also taken for catalyzed reporter deposition fluorescence in situ hybridization (CARD-FISH) analysis to identify and quantify the GDGT-producing organisms at different locations and water depths. These results will help interpreting GDGT-based proxies for temperature, water pH and terrestrial organic matter inputs (Schouten et al., 2013).

Table 4.2-2: Location, depth and volume of water sampled and filtered for lipid analysis.

Location	Water depth (m)	Sampled water (L)	Filtered water (L)	Comments
Gotland basin	5	800	624	photic zone (oxic)
Gotland basin	82	800	700	lower redoxcline (suboxic)
Gotland basin	120	800	765	below the redoxcline (oxic)
Gotland basin	220	800	700	bottom water (anoxic)
Landsort Deep	5	800	700	photic zone (oxic)
Landsort Deep	89	800	715	lower redoxcline (suboxic)
Landsort Deep	120	800	726	below the redoxcline (anoxic)
Landsort Deep	420	800	720	bottom water (anoxic)
Bornholm basin	3	680	642	photic zone (oxic)
Bornholm basin	85	290	278	bottom water (suboxic)

4.3. Geophysical Measurements

4.3.1. Multibeam Echo Sounder

During Poseidon cruise 507, extensive multibeam mapping provided new high-resolution data of Landsort Deep. Mapping was carried out using a hull-mounted L-3 ELAC Nautik GmbH SB3050 multibeam system, with a 50 kHz central frequency and 1.5°x2° TX/RX apertures. The system covers a maximum swath width of 140°, separated into 630 beams at maximum. In single profiling mode a transmission cycle is characterised by three continually pitch and yaw corrected and simultaneous transmitted acoustic fans. To provide a better separation between the received signals, the frequency of the centre fan slightly differs from the frequency of the outer fans. The multi ping mode, which was used during the POS507 cruise, processes to swaths in one ping to increase data density. The received signals are processed by the transceiver electronic (SEE37) of the SB3050, which performs an A/D conversion of the voltage to make the echo time series usable for later multibeam processing. The resulting bathymetry data were visualized and stored in Hydro Star (XSE) and in HYPACK/HYSWEEP format (HSX). The accurate measurement for ship positioning and movement are based on GPS data obtained by the two GPS antennas combined with intertial measurements of the Coda octopus F180 system. The GPS reference ellipsoid of the F180 motion sensor was set to WGS84. The obtained Data (Positioning, Heading, Pitch, Roll and Heave) were frequently sent to the multibeam system for correction purpose. The offsets entered into the various software are shown in Table 4.3-1. For sound speed approximation for the surface water the WERUM keel mounted sensor were used. In addition to the surface sound velocity profile vertical sound velocity profiles retrieved at all CTD stations during POS507 were loaded in Hypack.

The average ship speed during the bathymetric surveys was 4-7 kns. Due to frequent bad weather conditions and strong winds (5-8 bft) with a high swell during large parts of the expedition, large parts of the data contain errors and only have an acceptable quality. However, due to extensive postprocessing and data cleaning, the resulting maps are of good quality and show many new details of the Landsort Deep. The beam angle was mostly set in Hydrostar to automatic mode, but manually limited if necessary (mostly due to adverse weather conditions and reduced quality on the outer beams). The pingmode was also set to auto since this resulted in the best data quality. Source Level and pulse length also set to automatic. For bottom search the gates were set manually during periods of exceptional bad weather.

The raw HSX data were imported to MBMAX for processing and pre-filter, while the XSE data were recorded as a backup and have not been looked at onboard. Processing included the application of SVP profiles, the application of an over/under filter, the removal of beams flagged as low quality (frequent due to weather conditions) and the application of a matrix-based filter with a 4 sigma exclusion limit above and below the seafloor. Area-based editing of large parts of the collected data sets has already been carried out, although the cleaning and postprocessing performed aboard POSEIDON is preliminary and will be finished on shore. No water column data were collected. An overview map of the available data in Landsort Deep is shown in Fig.4.3-2.

Table 4.3-1: Offsets between IMU, GPS antennae and multibeam transducer as used in the different software systems.

Offset	*F180 IMU to Antennae*	*Hysweep Sonar Head*	*Hydrostar Nav Sensor*	*Hydrostar Hydrophone*	*Hydrostar Projector*
Forward	-2.3920 m	1.50 m	0 m	-1.5m	-1.41 m
Starboard	0.1110 m	6.36 m	0 m	6.36 m	5.2 m
Vertical	-7.3330 m	4.25 m	-5.65 m	4.25 m	4.25 m
Rotation	89.811°	-	-	-	-
Elevation	0.3438 m	-	-	-	-
Roll	-	-	-	1.45 °	0 °
Pitch	-	-	-	0 °	-2.4 °
Yaw	-	-	-	0 °	2 °
Time delay	-	-	0 s	0 s	0

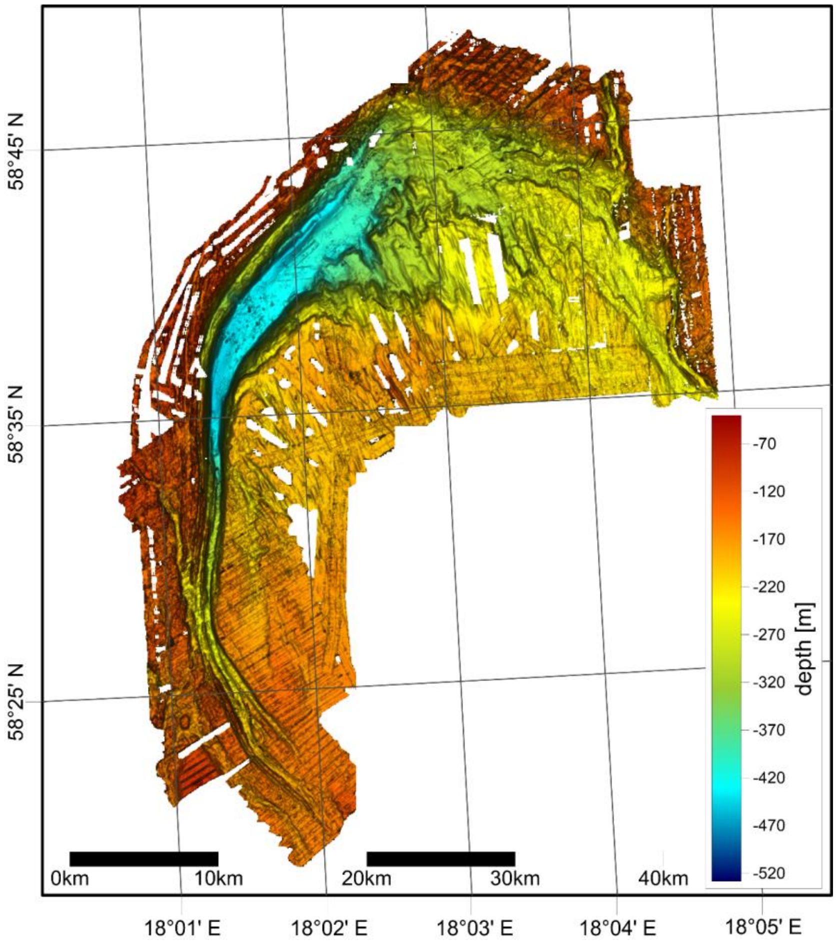

Fig. 4.3-2: Bathymetric data recorded during cruise P507 in Landsort Deep.

4.3.2. Seismics

Seismic data were acquired during the P507 cruise using a) parametric Innomar SES-2000 sediment echo sounder installed in the moon-pool of Poseidon (Fig. 4.3-3) and b) using a towed multi-channel sparker system.

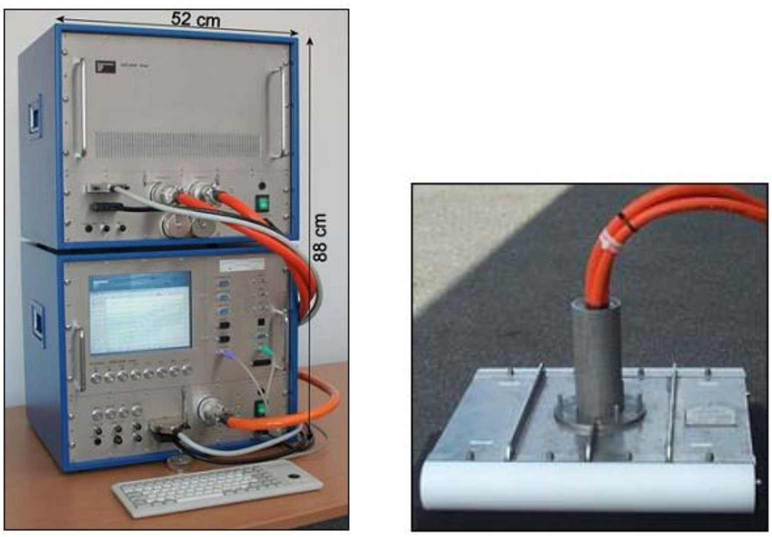

Fig. 4.3-3: The portable parametric sediment echosounder SES-2000-medium, recording and transmitting units (blue boxes); Innomar Technology GmbH, pictures from the User's Guide

The SES-2000 is based on the parametric acoustical effect, occurring when two waves of slightly different frequency interact nonlinearly and generate an additional acoustic wave of lower frequency (the difference of the higher frequencies). This additional wave is of low enough frequency to penetrate the seafloor up to few tens of meters, depending on sediment composition, while maintaining a high lateral resolution due to a narrow footprint. Parametric seismic data were continuously recorded during the bathymetric surveys, with a low frequency of 10 kHz, a high frequency of 100 kHz and the deep water mode of the SES control software enabled. Depending on weather conditions, parts of the data are of lower quality, amplified by failure of the SES motion sensor towards the end of the cruise. SES data were converted to *segy* and loaded into the KINGDOM software, which was then used to determine appropriate sites for gravity- and multicores.

Severe weather conditions caused considerable noise. Vertical stripes are caused by interference with the sparker system. In Figure 3.4-4 an example of a high-frequency seismic section crossing the contourite is shown. Five different internal units can be recognized within the contourite. The right panel in Figure 3.4-4 shows a seismic line crossing the south-western, channel-shaped boundary of the Landsort Deep. Layered deposits prevail near the base of the channel, on the interchannel highs and to the sides of the channel, while transparent units dominate the upper part of the sedimentary sequence within the channel. These transparent deposits may correspond to mass wasting deposits observed in several gravity cores during POS507.

A towed sparker system was used to achieve a deeper penetration of the sediments in Landsort Deep. The system comprises a power supply capable of discharging 1 kJ (900 J used during the survey), a metallic frame discharging the energy into the water and a 6-element multi-channel streamer. The distance between the individual hydrophone groups is 2 m, with each group comprising 5 hydrophones with a 10 cm distance. The sparker frame was towed at the starboard side of the vessel with a distance to the stern of 13 m.

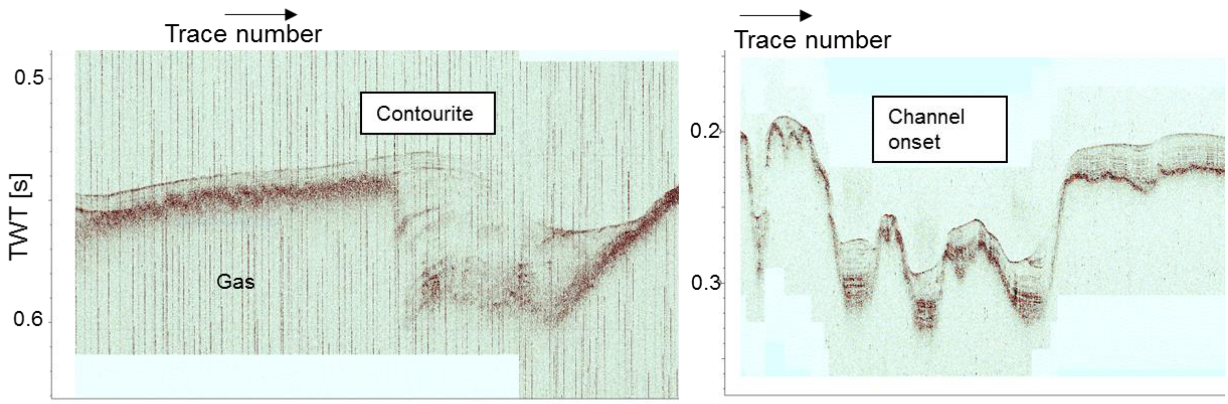

Fig. 4.3-4 Example of unprocessed SES data from the Landsort Deep.

Using a small crane, the streamer was towed 1.5 m towards starboard of the sparker frame, with the distance of the first hydrophone group to the stern being 15 m. The towing speed of the sparker was 3-4 kn, with a shot interval of 1 Hz and a sampling frequency of 50 kHz. The ship-GPS data was stored within the data. The effective frequency of the system is c. 1 kHz, generally allowing to image sediments down to the crystalline basement (Fig. 4.3-5). Unfortunately, the sparker seismic survey had to be ended prematurely due to a power supply failure that could not be fixed onboard. Sparker data was not processed onboard P507.

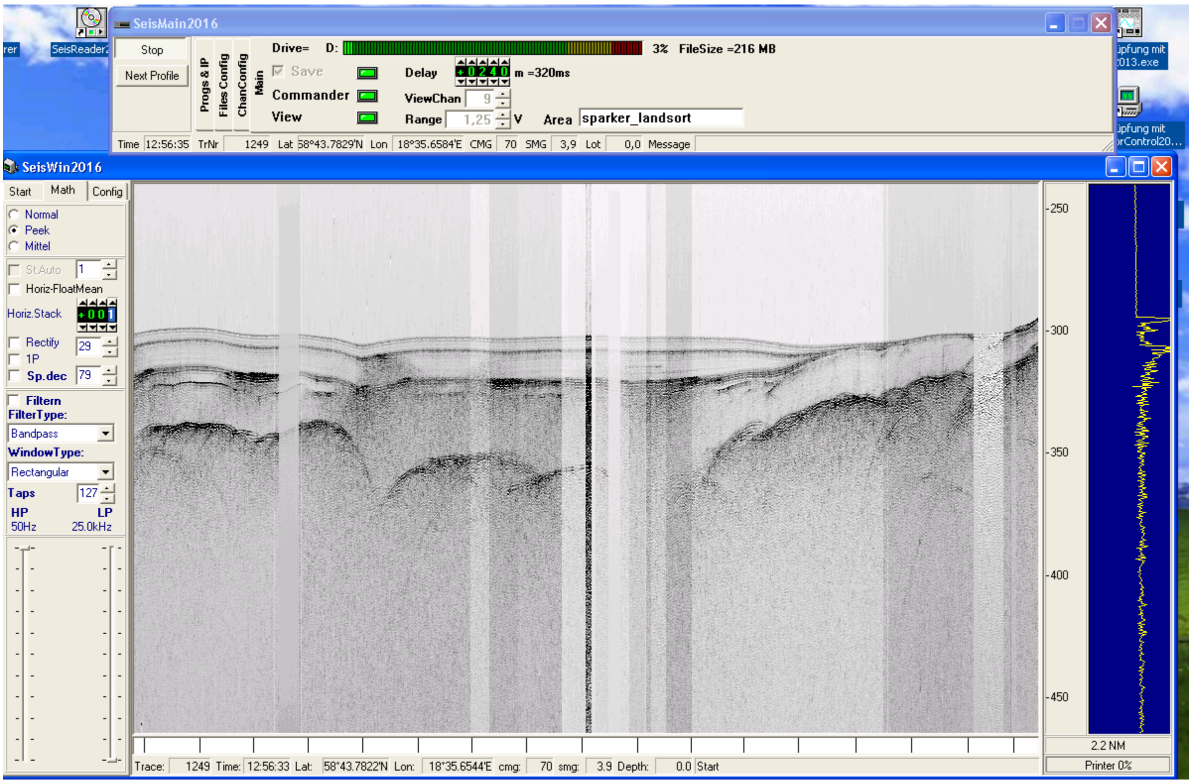

Fig. 4.3-5: Example of unprocessed data recorded using the sparker systems. Several sedimentary layers above the crystalline basement are clearly observed.

4.4. Sediment Sampling

We retrieved sediment cores and surface sediments by means of gravity coring for long sediment cores and an multi-corer for short cores.

The IOW multi-corer used during cruise P507 is capable of retrieving eight cores of up to 60 cm lengths with a preserved fluffy surface layer and including the bottom water. During POS507 the multi-corer was successfully deployed 27 times. Standard sampling procedure included one core for biomarker surface sampling, one core for 1-cm slicing, one core for length-wise splitting/archiving, and two cores for vertical archiving (Fig. 4.3-6). Besides sediment sampling, pore waters were extracted at three selected stations by using rhizons (Seeberg-Elverfeldt et al., 2005) immediately after retrieving the cores. Pore waters will be analysed in the home lab for major ions (Na, Ca, Mg, K), trace elements (e.g. Ba, Fe, Mn, Mo, Sr), and the nutrients phosphate and silica by ICP-OES. H_2S and SO_4 will be determined spectrophotometrically. Such data will be used to estimate the impact of present biogeochemical processes on the sedimentary record. Furthermore, we aim to investigate metal and nutrient cycling in surface sediments as well as the release of these components into the overlying bottom waters in different water depths.

During RV Poseidon expedition POS507, we successfully deployed a gravity corer (GC) with a core diameter of 12 cm and a barrel weight of ~1.8 tons 15 times recovering between 51 and 1165 cm long sediment cores. The deployments resulted in a total core recovery of ca. 110 m. Commonly the orientated core liners were cut after deployment into 1 m sections and labelled. All cores were immediately split in order to minimize textural changes due to outgassing of the sediments. Subsequently they were described and photographed before storing them in labeled D-tubes.

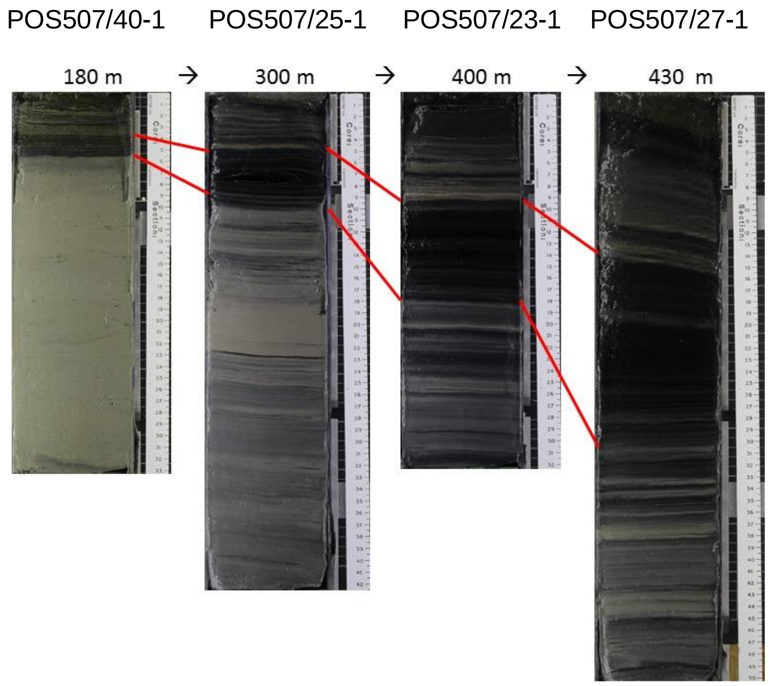

Fig. 4.3-6: Core photos of the extremely liquid multi-cores from the Landsort Deep nicely showing the increasing accumulation rate towards the central part of the basin. Both gravitational and current-related sediment focusing processes are active here. Additionally, Manganese precipitates add to the overall sedimentation in the deepest part of the anoxic basin.

GC cores were retrieved for two main purposes. One was to sample the Holocene sediment drift occupying the northeastern part of the Landsort Deep (Fig. 4.3-7, Fig. 4.3-8). Second task was to identify and sample postglacial mass wasting events in the basin (Fig. 4.3-9).

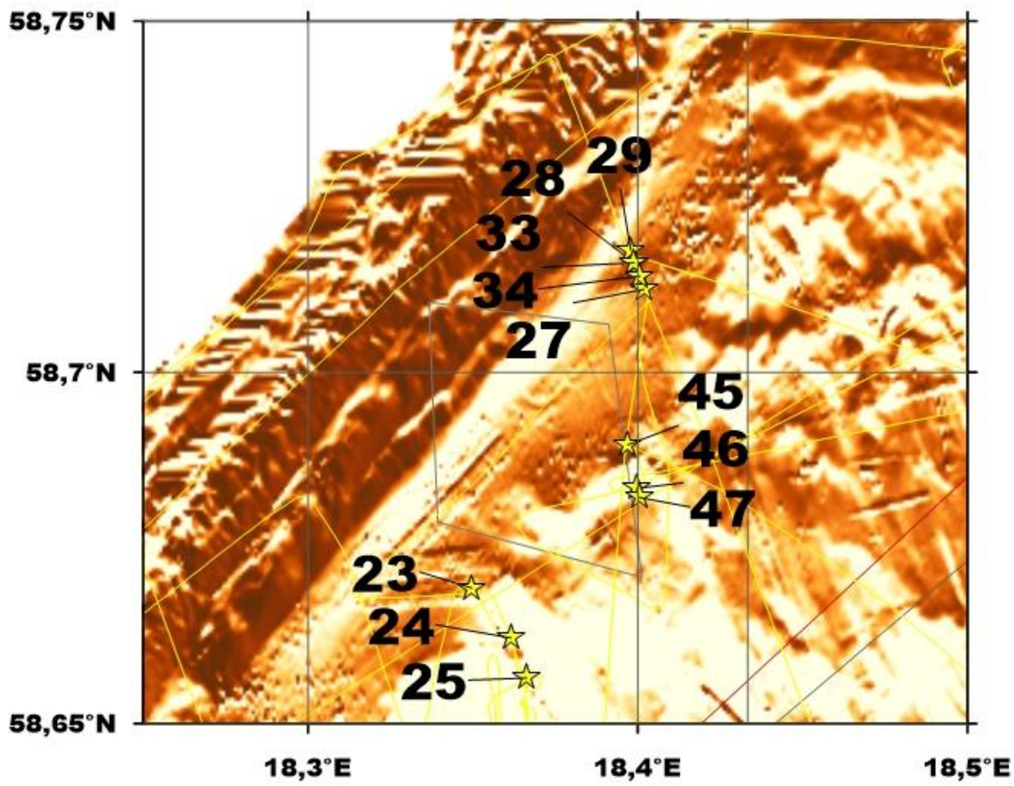

Fig. 4.3-7: Shaded relief map of the drift sediments in the Landsort Deep with the respective coring locations.

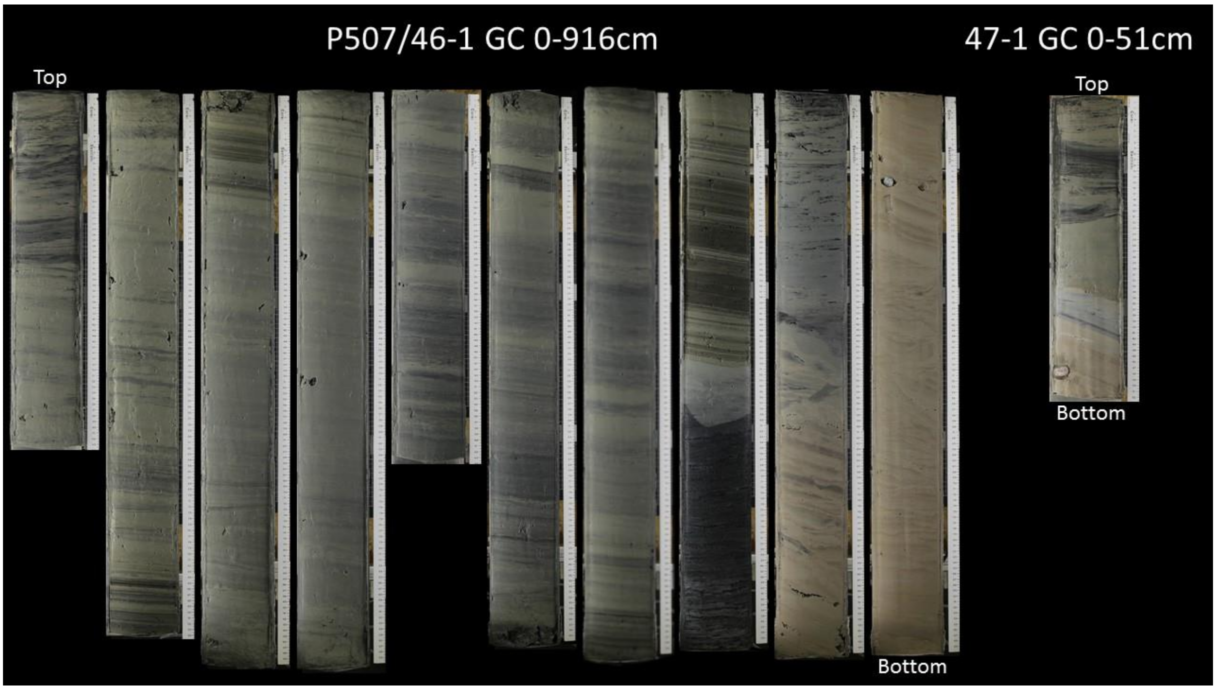

Fig. 4.3-8: Core photos of drift sediments in the Landsort Deep. Core 46-1 was cored at the southern shoulder of the drift and core 47-1 within the channel confining the southern extension of the drift.

Fig. 4.3-9: Core photos of the uppermost 2 m of the sediment core 50-1 from the southern part of the Landsort Deep documenting a succession of several Holocene mass wasting events.

5. References

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6. Station List

Station No.		Alias	Gear	Date	Time	Latitude	Longitude	Water depth	Remarks / core recovery /
RV POSEIDON	POS507				[UTC]	[°N]	[°E]	[m bsl]	[cm]
POS507/698-1	1-1		CTD/RO	17.10.2016	06:25	56°57,643'	019°31.571'	160.4	water samples at 157, 149, 140, 120, 90, and 68 m w.d.
POS507/698-2	1-2		MUC		07:04	56°57.662'	019°31.630'	162.8	28
POS507/699-1	2-1		MUC		08:35	56°57.936'	019°22.220'	169.8	51
POS507/700-1	3-1		MUC		10:26	56°58.262'	019°13.425'	171.1	40
POS507/701-1	4-1		MUC		12:04	56°58.841'	019°05.649'	154.4	40
POS507/702-1	5-1		MUC		13:33	56°59.390'	018°57.490'	125.8	45
POS507/703-1	6-1		CTD/RO		15:14	56°59.713'	018°53.488'	107.7	no water samples
POS507/703-2	6-2		GWS		15:15	56°59.713'	018°53.494'	111.8	400l at 20 m w.d.
POS507/704-1	7		MB/SES		15:36	56°57.950'	019°22.050'	177.6	start of profile
POS507/704-1	7		MB/SES	18.10.2016	03:30	57°16.050'	019°47.740'	207.2	end of profile
POS507/705-1	8-1	GB-OD	CTD/RO		04:16	57°16.003'	019°47.736'	210.2	water samples at 202, 195, 190, 123, 67, 5 m w.d.
POS507/705-2	8-2	GB-OD	MUC		06:09	57°16.016'	019°47.754'	207.0	35
POS507/706-1	9-1		MUC		08:38	57°04.380'	019°48.060'	209.8	empty
POS507/706-2	9-2		MUC		08:55	57°04.380'	019°48.040'	209.0	empty
POS507/706-3	9-3		MUC		09:22	57°04.385'	019°48.063'	210.8	34

POS507/707-1	10-1		MUC		10:49	57°06.343'	019°50.770'	214.7	53
POS507/708-1	11-1	TF271	CTD/RO		13:20	57°18.330'	020°04.709'	237.2	water samples at 239, 220, 212, 200, 178(bottle not released) ,158, 120, 100, 82, 75, and 65 m w.d.
POS507/708-2	11-2	TF271	GWS		14:07	57°18.360'	020°04.730'	237.4	400 l at 5 m w.d.
POS507/708-3	11-3	TF271	GWS		14:43	57°18.350'	020°04.730'	236.7	400 l at 5 m w.d.
POS507/708-4	11-4	TF271	GWS		15:14	57°18.350'	020°04.730'	237.5	400 l at 82 m w.d.
POS507/708-5	11-5	TF271	GWS		15:43	57°18.350'	020°04.750'	237.4	400 l at 82 m w.d.
POS507/709-1	12		MB/SES		16:28	57°18.340'	020°04.810'	237.1	start of profile
POS507/709-1	12		MB/SES	19.10.2016	03:45	57°18.360'	020°04.770'	240.2	end of profile
POS507/710-1	13-1	TF271	CTD/RO		05:14	57°18.314'	020°04.696'	237.0	water samples at 235, 230, 225, 218, 210 (bottle not released) ,178, 120, 90, 80, 65, and 10 m w.d.
POS507/710-2	13-2	TF271	CTD/RO		06:44	57°18.359'	020°04.731'	237.2	water samples at 236, 230, 220, 212, 200 , 178, and 82 m w.d.
POS507/710-3	13-3	TF271	GWS		07:14	57°18.351'	020°04.738'	236.7	400 l at 120 m w.d.
POS507/710-4	13-4	TF271	GWS		07:46	57°18.370'	020°04.670'	237.2	400 l at 120 m w.d.
POS507/710-5	13-5	TF271	GWS		08:18	57°18.350'	020°04.690'	239.6	400 l at 220 m w.d.
POS507/710-6	13-6	TF271	GWS		08:51	57°18.346'	020°04.695'	236.9	400 l at 220 m w.d.
POS507/710-7	13-7	TF271	MUC		09:20	57°18.336'	020°04.693'	236.9	38
POS507/711-1	14-1		MUC		11:13	57°22.918'	020°07.602'	226.2	45
POS507/711-2	14-2		MUC		11:43	57°22.938'	020°07.563'	225.9	45
POS507/712-1	15-1		MUC		12:50	57°25.282'	020°01.946'	185.4	26
POS507/713-1	16-1		MUC		13:52	57°27.175'	019°57.285'	181.3	38
POS507/714-1	17-1		MUC		15:18	57°29.848'	019°50.990'	141.6	30
POS507/715-1	18-1		CTD/RO	20.10.2016	05:29	58°38.470'	018°15.920'	456.0	water samples at 435, 400, 300, 200, 140, 120, 110, 100, 95, 90, 85, 80, and 65 m w.d.
POS507/715-2	18-2		MUC		06:21	58°38.435'	018°15.905'	441.3	overpenetration, samples discarded
POS507/715-3	18-3		MUC		07:19	58°38.450'	018°15.892'	444.3	53
POS507/715-4	18-4		GC12		09:04	58°38.449'	018°15.906'	439.8	1110
POS507/716-1	19-1		GC12		12:15	58°37.907	018°16.794	426.2	926
POS507/717-1	20-1		GC12		14:31	58°37.218'	018°17.994'	225.7	1050
POS507/718-1	21		MB/SES		16:55	58°39.330'	018°36.060'	233.6	start of profile
POS507/718-1	21		MB/SES	21.10.2016	04:34	58°40.310'	018°40.670'	240.0	end of profile
POS507/719-1	22-1		GC12		06:12	58°36.978'	018°18.366'	191.4	1030
POS507/719-2	22-2		MUC		07:30	58°36.989'	018°18.398'	185.0	empty, not released
POS507/719-3	22-3		MUC		07:45	58°36.984'	018°18.383'	193.4	25
POS507/720-1	23-1		MUC		09:16	58°40.158'	018°20.981'	411.1	30

POS507/721-1	24-1		MUC		11:15	58°39.733'	018°21.693'	359.7	25
POS507/722-1	25-1		MUC		12:26	58°39.388'	018°21.977'	304.5	43
POS507/723-1	26		MB/SES		14:55	58°40.900'	018°17.690'	283.8	bad weather, station work cancelled start of profile
POS507/723-1	26		MB/SES	24.10.2016	05:27	58°41.260'	018°24.100'	377.5	end of profile
POS507/726-1	27-1		MUC		06:27	58°42.705'	018°24.114'	381.3	50
POS507/727-1	28-1		MUC		07:19	58°42.930'	018°23.952'	387.8	53
POS507/728-1	29-1		MUC		08:36	58°43.043'	018°23.872'	399.9	overpenetration, samples discarded
POS507/728-2	29-2		MUC		09:15	58°43.046'	018°23.858'	400.9	57
POS507/726-2	27-2		GC12		11:54	58°42.708'	018°24.126'	377.9	998
POS507/727-2	28-2		GC12		12:58	58°42.935'	018°23.949'	394.5	1165, overpenetration >50 cm
POS507/728-2	29-2		GC12		14:20	58°43.047'	018°23.859'	401.1	1032
POS507/729-1	30		MB/SES		16:55	58°40.240'	018°40.680'	250.1	start of profile
POS507/729-1	30		MB/SES	25.10.2016	03:20	58°46.610'	018°15.969'	109.9	end of profile
POS507/730-1	31-1		CTD/RO		06:22	58°38.450'	018°15.950'	436.1	water samples at 60, 65, 70, 75, 80, 83, 86, 89, 93, 98, 105, 110, and 115 m w.d.
POS507/730-2	31-2		GWS		07:06	58°38.450'	018°15.980'	435.6	400 l at 5 m w.d.
POS507/730-3	31-3		GWS		07:31	58°38.470'	018°15.930'	436.1	400 l at 5 m w.d.
POS507/730-4	31-4		GWS		07:58	58°38.450'	018°15.940'	439.7	400 l at 89 m w.d.
POS507/730-5	31-5		GWS		08:27	58°38.460'	018°15.960'	440.2	400 l at 89 m w.d.
POS507/730-6	31-6		GWS		09:01	58°38.450'	018°15.920'	436.8	400 l at 420 m w.d.
POS507/730-7	31-7		GWS		10:09	58°38.470'	018°15.900'	440.7	400 l at 420 m w.d.
POS507/730-8	31-8		GWS		10:44	58°38.450'	018°15.920'	440.2	400 l at 120 m w.d.
POS507/730-9	31-9		GWS		11:11	58°38.450'	018°15.910'	436.3	400 l at 120 m w.d.
POS507/730-10	31-10		CTD/RO		12:04	58°38.470'	018°15.950'	435.8	water samples at 5, 50, 55, 91, 120, 130, 150, 180, 250, 340, 380, 420, and 436 m w.d.
POS507/731-1	32		MB/SES		13:14	58°38.430'	018°16.030'	434.2	start of profile
POS507/731-1	32		MB/SES	26.10.2016	04:25	58°25.830'	018°21.410'	153.8	end of profile
POS507/732-1	33-1		GC12		07:00	58°42.935'	018°23.931'	406.0	760
POS507/733-1	34-1		GC12		08:06	58°42.820'	018°24. 040'	380.3	sediment core discarded
POS507/733-2	34-2		GC12		09:14	58°42.815'	018°24.040'	383.9	957
POS507/734-1	35		SPS		10:37	58°40.030'	018°24.080'	344.4	start of profile
POS507/734-1	35		SPS		21:56	58°40.83'	018°14.590'	113.2	end of profile, equipment failure
POS507/735-1	36		MB/SES	27.10.2016	00:37	58°27.700'	018°20.740'	168.4	start of profile
POS507/735-1	36		MB/SES		02:05	58°24.300'	018°09.280'	131.4	end of profile
POS507/735-1	37		MB/SES		03:06	58°25.670'	018°21.840'	151.6	start of profile
POS507/735-1	37		MB/SES		08:56	58°24.820'	018°21.960'	150.1	end of profile

POS507/736-1	38-1		MUC		10:55	58°38.130'	018°21.947'	297.7	40
POS507/737-1	39-1		MUC		11:59	58°38.746'	018°21.960'	240.5	36
POS507/738-1	40-1		MUC		12:46	58°38.385'	018°21.781'	202.9	34
POS507/739-1	41-1		MUC		13:52	58°36.751'	018°22.264'	168.6	not released
POS507/739-1	41-2		MUC		14:03	58°36.748'	018°22.310'	163.9	not released
POS507/740-1	42-1		MUC		14:43	58°34.379'	018°23.231'	181.8	35
POS507/741-1	43		MB/SES		16:44	58°23.900'	018°19.540'	144.7	start of profile
POS507/741-1	43		MB/SES	28.10.2016	04:48	58°25.090'	018°14.330'	218.4	end of profile
POS507/742-1	44		MB/SES		06:48	58°26.410'	018°12.630'	212.3	bad weather, station work cancelled start of profile
POS507/742-1	44		MB/SES	28.10.2016	10:08	58°36.510'	018°36.740'	205.4	end of profile
POS507/743-1	45-1		GC12		12:03	58°41.382'	018°23.819'	390.1	810
POS507/744-1	46-1		GC12		13:11	58°41.007'	018°23.981'	403.7	916
POS507/745-1	47-1		GC12		14:14	58°40.934'	018°24.026'	391.6	51
POS507/746-1	48		MB/SES		15:59	58°42.620'	018°44.200'	158.1	start of profile
POS507/746-1	48		MB/SES	29.10.2016	02:21	58°34.910'	018°48.550'	224.0	end of profile
POS507/747-1	49-1		CTD/RO		03:47	58°36.201'	018°42.555'	209.7	water samples at 60, 65, 68, 72, 75, 81, 94, 130, 180, and 210 m w.d.
POS507/748-1	50-1		GC12		07:27	58°34.088'	018°13.842'	424.5	873
POS507/749-1	51-1		GC12		09:31	58°26.448'	018°13.146'	244.3	976
POS507/750-1	52-1		CTD/RO		12:49	58°25.090'	018°14.330'	435.6	water samples at 445, 303, and 203 m w.d.
POS507/750-2	52-2		CTD/RO		13:21	58°25.090'	018°14.330'	436.7	water samples at 121, 88, and 79 m w.d.
POS507/750-3	52-3		CTD/RO		13:42	58°25.090'	018°14.330'	436.4	water samples at 7, 38, and 68 m w.d.
POS507/750-4	52-4		CTD/RO		14:09	58°25.090'	018°14.330'	440.4	water samples at 440 m w.d.
POS507/751-1	53		MB/SES		16:04	58°36.720'	018°44.990'	258.0	start of profile
POS507/751-1	53		MB/SES	30.10.2016	06:50	58°33.140'	018°07.070'	81.1	end of profile
POS507/752-1	54-1		MUC		09:48	58°18.787'	018°30.011'	74.9	30
POS507/753-1	55-1		CTD/RO	31.10.2016	10:23	55°17.500'	015°45.000'	95.0	water samples at 0, 5, 10, 20, 30, 40, 50, and 60 m w.d.
POS507/753-2	55-2		CTD/RO		11:05	55°17.500'	015°45.000'	95.0	water sample at 85 m w.d.
POS507/753-3	55-3		CTD/RO		11:22	55°17.500'	015°45.000'	95.0	water sample at 85 m w.d.
POS507/753-4	55-4		CTD/RO		11:36	55°17.500'	015°45.000'	95.0	water sample at 85 m w.d.
POS507/753-5	55-5		CTD/RO		11:47	55°17.500'	015°45.000'	95.0	water sample at 85 m w.d.
POS507/753-6	55-6		CTD/RO		11:59	55°17.500'	015°45.000'	95.0	water sample at 85 m w.d.
POS507/753-7	55-7		APSN		12:23	55°17.500'	015°45.000'	95.0	vertical cast, 0-85 m w.d.
POS507/753-8	55-8		APSN		12:35	55°17.500'	015°45.000'	95.0	vertical cast, 0-85 m w.d.
POS507/753-9	55-9		APSN		12:47	55°17.500'	015°45.000'	95.0	vertical cast, 0-85 m w.d.
POS507/753-10	55-10		WP-2		13:03	55°17.500'	015°45.000'	95.0	vertical cast, 0-85 m w.d.

POS507/753-11	55-11		WP-2		13:12	55°17.500'	015°45.000'	95.0	vertical cast, 0-85 m w.d.
POS507/753-12	55-12		WP-2		13:22	55°17.500'	015°45.000'	95.0	vertical cast, 0-85 m w.d.
POS507/753-12	55-13		SW		11:30-13:22	55°17.500'	015°45.000'	95.0	surface water (3 m w.d.) with hose pumping
POS507/754-1	56-1		WP-2		21:26	54°55.500'	013°29.950'	44.5	vertical cast, 0-40 m w.d.
POS507/754-2	56-2		WP-2		21:35	58°55.500'	013°29.950'	44.5	vertical cast, 0-40 m w.d.
POS507/754-3	56-3		WP-2		21:45	58°55.500'	013°29.950'	44.5	vertical cast, 0-40 m w.d.

Gear abbreviations

CTD/RO	Conductivity-Temperature-Depth-profiler with 24 5l-Nisquin bottles
GWS	Giant Water Sampler
SW	Surface Water
APSN	Apstein Net
WP-2	WP2 Net
MUC	Multi Corer
GC	Gravity Corer
MB/SES	Multibeam + Sediment Acoustics
SPS	Sparker Seismics

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